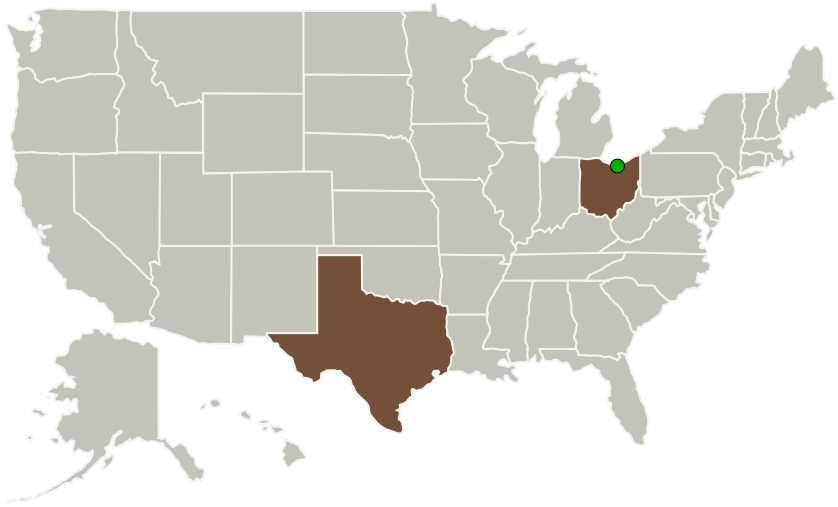
Carbon-Carbon High Melt Coating for Nozzle and Nozzle Extensions, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

C-CAT, which has proven carbon-carbon fabrication capabilities, will investigate use of ACC-6 High Melt oxidation protective system on carbon-carbon for use on the Cryogenic and Non-Toxic Storable Propellant Space Engine nozzle and nozzle extensions. ACC-6 High Melt is a carbon-carbon coating application that embeds HfC,ZrB2 in the outer layers. This material system has been tested in Arc Jet environment at over 3000 degrees F, for more than 24 minutes with little to no erosion. ACC-6 High Melt has shown to be the best performing high temperature material system, and still retains the ease of manufacturing associated with carbon-carbon. ACC-6 High Melt has been manufactured in small scale leading edge experiments, but has yet to be demonstrated in large components. Manufacturability of large scale components remains as the main question to be answered for this material system. For Phase I, C-CAT proposes to build subsections of a nozzle extension representing the attach flange and the exit diameter of approximately 40" diameter. Success will be achieved by manufacturing the aforementioned subsection using ACC-6 High Melt with no voids or spalling of coating. This successful demonstration will provide the path for scale-up to a full size prototype nozzle extension for Phase II.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Carbon-Carbon Advanced Technologies, Inc.	Lead Organization	Industry	Kennedale, Texas
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Texas

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140632)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Carbon-Carbon Advanced Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

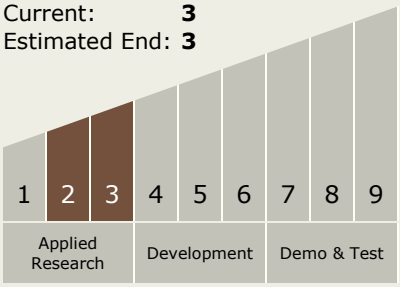
Carlos Torrez

Principal Investigator:

James Thompson

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System